

was a significant difference in FI ($P < 0.01$), with FI increasing with morsel size (fines: 2.76 kg, 3.5 mm pellets: 2.87 kg, 4.37 mm pellets: 2.98 kg). There was also a significant difference in AdjFCR ($P < 0.01$) with the 3.5 mm pellets (1.57 kg feed/kg gain) leading to a significantly improved AdjFCR as compared with either the fines (1.64 kg/kg) or 4.37 mm pellets (1.62 kg/kg). The results of this experiment indicated that birds performed more efficiently when fed the smaller diameter pellets.

Key Words: pellet diameter, feed form, pellet quality, growth performance, feed manufacturing

190 Effects of varying conditioning temperature and fat application on a broiler finisher diet. R. E. Loar II^{*1}, K. G. S. Wamsley¹, A. Evans², J. S. Moritz², and A. Corzo¹, ¹Mississippi State University, Mississippi State, ²West Virginia University, Morgantown.

A study was performed to evaluate the effects of different conditioning temperatures and alternate fat application methods on a standard broiler finisher diet. Data were collected to determine feed mill efficiency, amino acid (AA) digestibility and broiler growth and yield. There were 3 conditioning temperatures, 74, 85, and 96°C, and 2 methods of fat application, pre- and post-pellet, which resulted in a 3×2 factorial for a total of 6 treatments. Ross x Ross 708 females were used and fed identical industry standard rations from 0 – 28 d. The experimental period occurred from 28 – 42 d of age. Increased temperature and pre-pellet fat application both resulted in decreased energy usage at the pellet mill ($P < 0.001$). Post-pellet fat application also resulted in greater bulk density compared with pre-pellet application ($P < 0.001$). A temperature \times fat application interaction was seen for both pellet durability index and modified pellet durability index ($P < 0.001$) as well as feed conversion ($P = 0.07$). Feed conversion increased with increasing conditioning temperature and post-pellet fat application in the 85°C treatment. No other responses were observed for the carcass traits monitored. All treatments were analyzed for true digestible AA content via the use of precision-fed cecectomized roosters. Data from the AA digestibility assay points toward conditioning temperature having the most pronounced effect, as multiple AA showed significantly decreased digestibility with increasing temperature. Fat application method and conditioning temperature impact multiple aspects of broiler production. Increased steam conditioning temperature can lead to decreased feed mill energy usage and increased pellet quality and while increased temperatures may lead to nutrient degradation, pre-pellet fat application may help to alleviate some of that effect. Pre-pellet fat application can also aide in decreased energy usage in the mill, while post pellet fat application leads to increased pellet quality.

Key Words: conditioning, fat application, PDI, MPDI, amino acid

191 Quantification of small differences of ME in laying hen diets. N. A. Nachtrieb^{*} and M. E. Persia, Iowa State University, Ames.

The increase in the cost of corn and oil has necessitated the use of alternative energy sources, including feed additives, to cost effectively produce birds and eggs. To properly evaluate feed additives that claim to release energy from laying hen diets, the quantification of relatively small differences in dietary energy needs to be considered and has been a limitation when using a laying hen model. Three concentrations of dietary energy were evaluated over a 16 wk period in first cycle Hy-Line W-36 laying hens. The highest energy diet contained 2,850 and 2,800 kcal/kg over 1 to 11 and 12 to 16 wk, respectively, and met or exceeded typical industry recommendations for all other nutrients. The remaining diets contained the same basal diet with reduction in energy of 30 and

60 kcal/kg coming from a reduction in dietary oil. Each diet was fed to 8 replicate groups of 9 hens housed 3 hens per cage in 3 consecutive cages (439 cm²/bird) in a randomized complete block design. There were no significant differences among dietary groups in performance including egg production, feed intake, egg mass, feed conversion ratio or mortality over the 16 wk period ($P > 0.05$). At the end of the 16 wk period all hens were weighed and both groups of hens receiving reduced energy diets resulted in a small (40 to 50g) but significant reduction in body weight in comparison to the higher energy fed birds. One bird from each cage (3 per replicate group) was euthanized by CO₂ asphyxiation to determine abdominal fat pad weight and one bird per replicate group was utilized for fat mass determination using dual-energy x-ray absorptiometry (DXA). Fat mass determined via DXA scan was not sensitive enough to determine difference ($P > 0.05$), but abdominal fat pad weight was significantly reduced with decreasing dietary energy content resulting in 59.3, 49.0 and 47.9g total weight, respectively. It appears that both body weight and abdominal fat pad weight are more responsive and more sensitive to relatively small differences in dietary energy compared with laying hen performance.

Key Words: layer, energy, performance, abdominal fat pad

192 Effect of source and level of fiber of the pullet diets and energy content of the laying diets on performance of brown egg-laying hens from 17 to 48 weeks of age. O. Bouali¹, A. Pérez-Bonilla², J. García², P. Guzmán¹, B. Saldaña¹, and G. G. Mateos^{*1}, ¹Universidad Politécnica de Madrid, Madrid, Spain, ²Camar Agroalimentaria S.L., Toledo, Spain.

It is a common practice to increase the fiber content of the feed during the rearing period to enhance the ability of the pullets to consume more feed at the onset of the laying cycle. The inclusion in the diet of certain sources of fiber in adequate amounts might help to adapt the gastrointestinal tract (GIT) of the bird to the laying diet and improve hen productivity. In this experiment, 480 Lohmann Brown hens were fed previously (1 to 17 wk of age) 6 different diets: 2 of them differed in the main cereal used (corn vs. barley) and the remaining 4 diets formed a 2x2 factorial with 2 fiber sources (straw and sugar beet pulp) at 2 levels of inclusion (2 and 4%). The fiber source was included at expense (wt:wt) of the corn diet. From 17 to 48wk of age, hens were fed diets that differed in AMEn (2,650 or 2,750 kcal AMEn/kg) but had similar nutrient content per unit of AMEn. The experimental design was completely randomized with 12 treatments arranged as a 6×2 factorial with 6 diets during the rearing phase and 2 diets during the laying phase. Rearing feeds did not affect any of the production variables studied during the laying phase. At 48 wk of age, the composition of the rearing feeds did not affect the relative weight (% BW) of the GIT, the length (cm/kg BW) of the hen, tarsus, or small intestine, or the pH of the gizzard contents. Hens fed the high energy diet during the laying period, ate less feed ($P < 0.001$) but had better FCR ($P < 0.01$) and higher BW gain ($P < 0.05$) than hens fed the low energy diet. We conclude that neither the main cereal nor the fiber content of the diet fed during the rearing phase, affected subsequent egg production. Also, the use of high energy diets during the laying phase reduced ADFI and improved FCR, but did not affect egg production or egg weight.

Key Words: barley, egg production, pullet diet, straw, sugar beet pulp

193 Influence of main cereal and mean particle size of the diet on productive performance and egg quality of brown-egg laying hens. M. de Vega¹, A. Pérez-Bonilla², B. Saldaña¹, H. A. Mandawil¹, P. Guzmán¹, P. G. Rebollar¹, and G. G. Mateos^{*1}, ¹Universidad

Politécnica de Madrid, Madrid, Spain, ²Camar Agroalimentaria S.L., Toledo, Spain.

In total, 500 Lohmann Brown hens were used to study the effects of the main cereal and mean particle size (MPS) of the cereal on productive performance and egg quality from 17 to 49 wk of age. The experiment was completely randomized with 10 treatments organized as a 2×5 factorial with 2 main cereals (barley vs. corn) and 5 MPS that resulted from grinding the main cereal of the diet with a hammer-mill provided with a 4, 6, 8, 10, or 12 mm screen. Diets were isonutritive for major nutrients and included in all cases a carbohydrase and a phytase enzyme. Each treatment was replicated 5 times and the experimental unit was an enriched cage with 10 birds. Treatment sums of squares for effects of MPS of the main cereal on the different variables studied were partitioned into linear (L) and quadratic (Q) effects. No interactions between main effects were detected for any of the variables studied and therefore,

only main effects are presented. Main cereal of the diet affected ADFI ($P < 0.05$), egg weight ($P = 0.10$), and egg mass ($P = 0.06$) that were higher with barley than with corn feeding. Unexpectedly, the incidence of dirty eggs was higher ($P < 0.05$) with corn than with barley feeding. In contrast, egg production, feed conversion ratio per kilogram of eggs and per dozen of eggs, and BW gain. Egg quality was not affected by the main cereal of the diet. The MPS of the cereal had little effect on any of the traits studied except for BW gain that was higher ($P = 0.06$) for hens fed the diet ground to 4 mm than for the average of hens fed the other 4 diets. We conclude that type of cereal affects productive performance but that particle size had little effect on productivity of commercial laying hens.

Key Words: barley, corn, egg quality, hen performance, mean particle size